

### **NORTH CAROLINA**

Department of Transportation



















# Survey Control Sheets Overview

Location & Surveys Unit

September 2017

# Survey Control Sheets

- History of Control Sheets
- New Legislation/Response
- Overview of Individual Sheets

Property Ties

# Survey Control Sheets History

• 2003 Introduction

2010 Addition of R/W Tables

2017 Addition of R/W sheets

# Survey Control Sheets

### Control Sheets Breakdown

- C Series (Survey Control and Existing Centerlines)
- D Series (Design Alignment Cardinal Stations)
- E Series (R/W and Easement Tables)
- RW Series (Modified Plan Sheets for Clarity)

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## House Bill 501

10 "§ 136-19.4A. Required surveying information in certain acquisition plans.

The Department of Transportation shall include in any plan prepared for the purpose of acquiring right-of-way, a permanent easement, or both, that depicts property lines, right-of-way lines, or permanent easements, a set of drawings that clearly identify design alignments, baseline control points, found property-related corner markers, and new right-of-way and permanent easement corner markers. Plans subject to the requirements of this section shall document the localized coordinates for each major control point along the design alignments. The coordinates and associated localization metadata shall be based upon, and tied to, the North Carolina State Plane Coordinate system and shall be clearly identified within the plans. All property corner markers found and surveyed shall be clearly identified within the plans in accordance with general surveying standards and procedures. Each property corner marker shall be accurately tied to the design alignment or the North Carolina State Plane Coordinate system, by either a system of bearings and distances or by station and offset."

# Chief Engineer's Memo



### STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

ROY COOPER GOVERNOR JAMES H. TROGDON, III SECRETARY

April 18, 2017

To: Division Engineers, Division of Highways

Unit Heads, Technical Services

From: Mr. Mike L. Holder, PE

Chief Engineer, Division of Highways

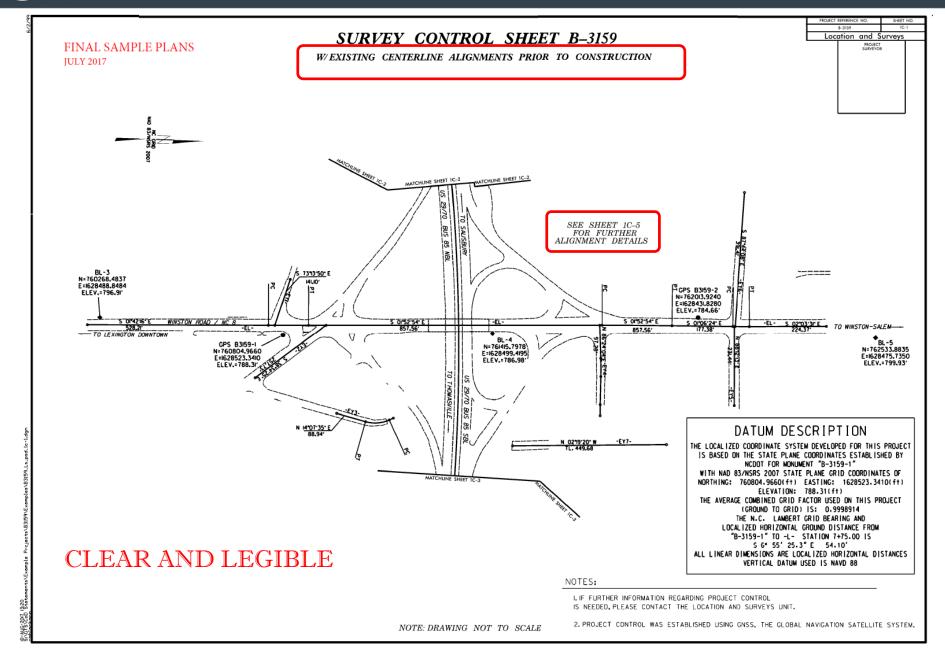
Subject: Mapping Requirements for Transportation Facility Plans

The following concerns have been expressed by the NC Board of Examiners for Engineers and Surveyors (NCBEES) regarding NCDOT highway and Secondary Road plans:

- 1. Lack of public availability of plans for NCDOT land acquisition.
- 2. Lack of metadata on plans, including coordinate system, control points set, and closures.
- 3. Complexity of plans (readability, alignments).
- 4. Lack of consistency in locating, documenting, and representing property boundaries.
- 5. Complexity of right of way deeds, based on station/offset.
- 6. Chain of responsible charge for the PLS doing survey/mapping work.
- Proper monumentation of the right of way (not part of the committee discussion but as a result of conversation with NCBEES).

## C Series Sheets

- Survey Control and Existing Centerlines
- Delivered with Full Surveys



### FINAL SAMPLE PLANS JULY 2017

### SURVEY CONTROL SHEET B-3159

W/EXISTING CENTERLINE ALIGNMENTS PRIOR TO CONSTRUCTION

EL									
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS
POT	760233.044	1628511.613							
LINE			N Ø1°42′16.2° W	528.21					
PC	760761.019	1628495.901							
CURVE			N Ø1*47′35.2* W	117.55	00°10'38.1'(LT)	00'09'02.8'	117.549	58,775	38000.000
PT	760878.510	1628492,223							
LINE			N 01°52′54.2° W	857.56					
PC	761735.686	1628464.064		202,91	00146/00 08/07	00°22'55.1°	202,907	101.455	15000.000
CURVE	201000 440	1000450 270	N 01°29′39.1° W	202.91	00°46'30.2"(RT)	69.55.22*1	202,907	CC4.101	13000.000
I INC	761938.443	1628458.773	N 01'06'24.0' W	177.38					
LINE	762115,785	1628455.347	N 01 06 24.6 W	1//.36					
CURVE	702113.763	1020433.347	N Ø1'34'57.5' W	49.84	00°57'06.9"(LT)	01*54'35.5*	49,842	24,922	3000.000
PT	762165.698	1628453.971	N 61 34 37.3 W	7 /204	00 37 00.7 (L1)	DI 37 33.3	7 4042	E-11.722	5000.000
LINE	702103.000	1020-3317/1	N 02°03′30.9° W	224.37					
POT	762389.829	1628445.911	02 03 36:7 #	22 1107					

EY									
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS
PC	761050.304	1626995.448							
CURVE			N 87"31'54.0" E	3007.14	30°35'22.0'(RT)	01'00'18.7"	3043,154	1558.779	5700.000
PT	761179,814	1629999,798							

EY1									
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	D0C	LENGTH	TANGENT	RADIUS
PC	760934.128	1627738.897							
CURVE			S 65*41'47.2 E	119.07	42*18'Ø3.8*(LT)	34*43'29.0*	121.818	63.835	165.000
PT	760885.122	1627847.415							
LINE			S 86"50"49.0" E	155.34					
	760876.578	1628002.517							
CURVE			S 85'08'11.0' E	119.40	Ø3*25′16.1'(RT)	02*51′53.2*	119,421	59.728	2000.000
PT	760866.455	1628121.490							
LINE			S 83*25'32.9* E	38.87					
	760862.005	1628160.101							
CURVE			S 78'19'41.4" E	204.36	10"11'42.9"(RT)	04"58'56.1"	204.632	102.587	1150.000
PT	760820.661	1628360.237							
LÍNE			S 73"13'50.0" E	141.10					
POT	760779,952	1628495.333							

EY2									
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	I DOC	LENGTH	TANGENT	RADIUS
POT	760929,095	1628490.561							
LINE			S 38*34'25.1' E	257.73					
POT	760727.602	1628651.260							

EY3									
TYPE	NORTH	EAST	BEARING	DISTANCE	DEL TA	DOC	LENGTH	TANGENT	RADIUS
POT	760968.602	1628746,945							
LINE			N 14 07 35.4 E	88.94					
	761054.847	1628768.651							
CURVE			N 06"05'42.2" W	69.13	40°26'35.3"(LT)	57*17'44.8*	70.587	36.836	100.000
	761123.537	1628761.311							
LINE			N 26'18'59.9' W	13.31					
POT	761135.515	1628755.411							

EY4									
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS
POT LINE	761728.481	1628464.298							
LINE			N 86*24'4.4* E	97,28					
PC	761734,587	1628561.390							
CURVE			N 87°55′54.5° E	53.42	Ø3*Ø3*4Ø.3*(RT)	Ø5*43'46.5*	53.428	26.720	1000.000
PT	761736,515	1628614.776							
LINE			N 89*27′44.7* E	81.78					
PC	761737.282	1628696.556				2511212121	50.004	10.100	
CURVE			N 88*37′19.7* E	32.26	01°40'50.0'(LT)	05'12'31.3'	32.264	16.133	1100.000
PT	761738.058	1628728.809		101.00					
LINE			N 87*46′54.7*E	481.09					
POT	761756.678	1629209.541							

Location and Surveys

EY5				
TYPE	NORTH	EAST	BEARING	DISTANCE
POT	762120,233	1628455,258		
LINE			N 88*12'13.2* E	231,44
POT	762127.488	1628686.589		

EY6				
TYPE	NORTH	EAST	BEARING	DISTANCE
POT	762138,459	1628064.092		
L[NE			S 87*44'7.6' E	391.41
POT	762122,993	1628455.199		

EY7				
TYPE	NORTH	EAST	BEARING	DISTANCE
POT	761484.504	1628824.594		
LINE			N 02'19'20.3' W	449.68
POT	761933.811	1628806.373		

EY8				
TYPE	NORTH	EAST	BEARING	DISTANCE
POT	761450,090	1629163.664		
LINE			N 02'08'5.5' W	422,56
POT	761872.361	1629147.922		

NOTES:

I. IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

## D Series Sheets

- Design Alignment Cardinal Stations
- This replaces the old "D" sheet produced by Roadway that had alignment points every 50"

FINAL SAMPLE PLANS
JULY 2017

### PROPOSED ALIGNMENT CONTROL SHEET B-3159

PROJECT REFERENCE NO. SHEET NO.
5-3159 10-1
Location and Surveys
PROJECT
SURVEYOR

		L	
TYPE	STATION	NORTH	EAST
POT	4.00.00	760376.4606	1628542.1223
PC	18-00.00	761775.7122	1628496.3530
PRC	19.28.79	761902.6830	1628476.7060
PT	20+64.72	762036.7839	1628456.8735
PC	21+43.74	762115.7852	1628455.3473
PT	21-93-58	762165.6048	1628453 9708
POT	23+00.00	762271.9584	1628450.1480

Y					
TYPE	STATION	NORTH	EAST		
PC	10.00.00	761050.3042	1626995.4477		
PT	40+43.15	761179.8138	1629999.7980		

Y2						
TYPE	STATION	NORTH	EAST			
POT	10.00.00	760766.5197	1628627.8014			
PC	10+70.07	760821.2796	1628584.0850			
PT	12.07.25	760947.7978	1628537.4414			
POT	12 36 06	760976 5975	1628536.4994			

		Y5	
TYPE	STATION	NORTH	EAST
POT	10.00.00	762120.2325	1628455.2581
POT	12+31.44	762127.4875	1628686.5886

TYPE STATION NORTH EAST	
POT 10+00.00 762132.2344 1628221.5	Ø81
POT 12+33.87 762122.9931 1628455.1	994

Y7						
TYPE	STATION	NORTH	EAST			
POT	10.00.00	761328.4367	1629790.5449			
PC	13.97.95	761401.7910	1629399.4152			
PT	18-02.23	761685.3168	1629154.9287			
POT	18+53.57	761736.6167	1629152.9893			

		RPA	
TYPE	STATION	NORTH	EAST
PDT	10.00.00	761296.9217	1629569.5565
TS	10+75.00	761311.7073	1629496.0283
SC	12+59.00	761357.2998	1629317.9736
CS	13+88.67	761415.4017	1629202,3416
ST	15+72.67	761531.0553	1629059.4906
PC	16-84.67	761605.9786	1628976 2410
PT	20+63.28	761716.7644	1628626.1059
PDT	21+91.53	761701.4219	1628498.7830

		RPC	
TYPE	STATION	NORTH	EAST
POT	10.00.00	761135.4976	1627437.2108
TS	10.75.00	761148.8353	1627511.0153
SC	12+59.00	761172.0339	1627693.3446
CS	14+40.28	761148.2066	1627872.3227
ST	16+24.28	761078.1144	1628042.2322
PC	17+36.28	761030.0558	1628143.3972
PT	19-08-96	760987.7639	1628309.6990
POT	21+22,08	760976.1398	1628522.5069

NOTES:

I.IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

NUG-2017 H21 15/CoU Statements/Exempl

NOTE: DRAWING NOT TO SCALE

## E Series Sheets

- R/W and Easement Tables
- Signed and Sealed by PLS

RIGHT OF WAY CONTROL SHEET B-3159

FINAL SAMPLE PLANS **IULY 2017** 

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
L	7+67.51	73.04	760746.1612	1628603.1075
L	7 68 15	73.90	760746.8307	1628603.9470
L	7 • 95 • 38	-3.60	760771.5113	1628525.6012
L	8 10 63	40.87	760788.2050	1628569.5427
L	8 53 81	-116.27	760826.2284	1628411.0815
L	18+37.00	42.00	761816.9023	1628535.6425
L	19+17.07	-51.34	761878.5459	1628430.0417
L	19+28.79	42.00	761914.0613	1628517.1354
L	20-64.72	-40.00	762036.0113	1628416.8809
L	20+64.72	40.00	762037.5566	1628496.8709
L	20+92.00	-40.00	762063.2837	1628416.3541

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
Y	33+50.00	106.00	761397.7160	1629327.0805
Y	34+00.00	-99.00	761385.3381	1629376.9452
Y	36+00.00	-90.00	761350.3463	1629577.4187
Y	37+50.00	-85.00	761321.2552	1629726.9963
Y	38+20.00	-145.00	761367.6155	1629807.9299
Y	38+20.00	-130.00	761352.8706	1629805.1749

		ROW MAR	KER CONCRET	E OR GRANITE-	E
[	ALIGN	STATION	OFFSET	NORTH	EAST
[	Y2	10-70.07	19.11	760833.2012	1628599.0177
[	Y2	10.70.07	20.00	760833.7577	1628599.7149
[	Y2	11.92.47	20.00	760935.0903	1628558.3303

	ROW MAR	KER CONCRETI	OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
Y5	10+85.00	20.01	762102.8942	1628540.8437

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
V.C	11+59 99	22 42	762182 GRCE	1020278 E8E1

1629566 9451 1629517.8018 761420.2856 17:28.59 -60.00 761573.2311 1629116-5316 18 - 02 23 18.02.23 -60.00 761683.0501 1629094.9715 761732.1538 1629093, 1152

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
RPA	13-88-67	55.00	761461.5250	1629232 3022
RPA	16+84.67	70.00	761658.0081	1629023.0697
RPA	20+63.28	70.00	761786.2616	1628617.7314

ROW MARKER CONCRETE OR GRANITE-E					
ALIGN	STATION	OFFSET	NORTH	EAST	
RPC	11+25.00	88.73	761070.0452	1627575.0204	
RPC	12+59.00	95.00	761077.0570	1627695.4399	
RPC	14+40.28	95.00	761057.0859	1627845.4522	
RPC	16+24.28	115.00	760974.2391	1627992.8873	
RPC	17+36.28	105.00	760935.2136	1628098.3423	
RPC	19+08.96	93.00	760894.9024	1628304.6267	
RPC	20-19-00	91.01	760890.8868	1628414.6133	

Location and Surveys

Statement and Seal

I, \_\_\_\_\_\_, a Professional Land Surveyor in the state of North Carolina hereby certify to the best of my knowledge and belief that the following work item(s) (R/W Staking) performed under my responsible charge meet NCDOT Survey Standards as directed in the NCDOT Location & Surveys guidelines and procedures.

I further certify that the data compiled came from available surveys/mapping performed by others and provided to me by NCDOT and do not certify to the accuracy or quality of the individual data sources.

I further certify that the right of way and permanent easement points shown herein and outlined in the tables shown hereon (localized coordinates, station/offset) have been checked and are accurate representations of the right of way and permanent easement points depicted on the corresponding highway plans. Ialso certify that the right of way and permanent easement points shown herein have been field monumented under my supervision from existing survey controlprovided by others; that the depicted property data shown herein were surveyed by others, and these monuments denote the right of way and easement boundaries at the time of staking which may be subject to change due to right of way revisions (See deeds for final determination).

Witness my original signature, registration number and sealthis 31st day of July, 2017.

ProfessionalLand Surveyor

PLS #

NOTE: DRAWING NOT TO SCALE

### NOTES:

I. IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

FINAL SAMPLE PLANS JULY 2017

PERMANENT	<b>EASEMENT</b>	<b>CONTROL</b>	SHEET	<b>B</b> –3159
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	PERM	ANENT EASEME	ENT MARKER-E	
ALIGN	STATION	OFFSET	NORTH	EAST
L	6+84.80	136.03	760665.5550	1628668.7673
L	7.58.83	·63.7Ø	760733.0147	1628466.7215
L	7+97.03	-73.08	760770.8844	1628456.1057
L	8.00.04	10.00	760776.6163	1628539.0386
L	18+01.78	-83.53	761774.4828	1628412.8145
L	18+58.00	62.00	761842.2086	1628552.6898
L	19+28.79	-72.00	761883.1774	1628407.3984
L	19+28.79	62.00	761919.4783	1628536.3831
L	20.64.72	62.00	762037.9814	1628518.8619
L	20.96.08	62.00	762069.3323	1628518.2563
L	21.05.41	-57.51	762076.3530	1628398.5883

PERMANENT EASEMENT MARKER-E					
ALIGN	STATION	OFFSET	NORTH	EAST	
Y	14.50.00	130.00	761043.9961	1627458.7392	
Y	34 - 49 . 00	129.39	761152.8466	1629399.2092	
Y	34+49.00	146.00	761136.3526	1629397.2267	
Y	34-58.69	146.00	761135.2179	1629406.6000	
Y	34+68.95	146.00	761133.9986	1629416.5255	
Y	34.78.00	129.33	761149.4531	1629427.3472	
Y	34 - 78 . 00	146.00	761132.9090	1629425.2732	

PERMANENT EASEMENT MARKER-E					
ALIGN	STATION	OFFSET	NORTH	EAST	
Y6	10.40.00	22.60	762108.0715	1628260.5838	
Y6	10.40.00	29.00	762101.6765	1628260.3310	
Y6	11.54.89	29.00	762097.1368	1628375.1299	

		PERM	ANENT EASEME	NT MARKER-E	
- 1	ALIGN	STATION	OFFSET	NORTH	EAST
	Y7	12:35.00	64.00	761434.6578	1629571.3690
	Y7	13-04.00	118.00	761500.4513	1629513.5053
-	Y7	13-55.00	52.39	761445.3714	1629451.2861

		PERM/	ANENT EASEM	ENT MARKER-E	
ĺ	ALIGN	STATION	OFFSET	NORTH	EAST
ĺ	RPA	16+06.38	100.00	761627.9321	1629101.3340
ĺ	RPA	16+84.67	100.00	761680.3071	1629043.1384
ľ	004	20 22 22	100.00	701010 0100	1000014 1404

PERMANENT EASEMENT MARKER-E						
ALIGN	STATION	OFFSET	NORTH	EAST		
RPC	12-59.00	115.00	761057.0619	1627695.8810		
RPC	13.05.00	115.00	761056.4287	1627732.8542		
RPC	13.58.93	226.19	760942.0307	1627759.5620		
RPC	13.65.00	115.00	761051.2587	1627780.8006		
RPC	14.40.28	115.00	761037.9026	1627839.7953		
RPC	14.48.24	243.55	760913.2328	1627807.9663		
RPC	16+24.28	135.00	760956.1730	1627984.3074		
RPC	17:36.28	125.00	760917.1462	1628289.7594		
RPC	19+08.96	113.00	760874.9321	1628303.5359		
RPC	20.19.00	112.00	760869.9287	1628413.4686		

I, ......, a Professional Land Surveyor in the state of North Carolina hereby certify to the best of my knowledge and belief that the following work item(s) (Base map Compilation, R/W Staking) performed under my responsible charge meet NCDOT Survey Standards as directed in the NCDOT Location & Surveys guidelines and procedures.

I further certify that the data compiled came from available surveys/mapping performed by others and provided to me by NCDOT and do not certify to the accuracy or quality of the

Ifurther certify that the right of way and permanent easement points shown herein and outlined in the tables shown hereon (localized coordinates, station/offset) have been checked and are accurate representations of the right of way and permanent easement points depicted on the corresponding highway plans. I also certify that the right of way and permanent easement points shown herein have been field monumented under my supervision from existing survey control provided by others; that the depicted property data shown herein were surveyed by others; and these monuments denote the right of way and easement boundaries at the time of staking which may be subject to change due to right of way revisions (See deeds for final

Witness my original signature, registration number and sealthis 1st day of August, 2017.

-----Professional Land Surveyor

NOTE: DRAWING NOT TO SCALE

NOTES:

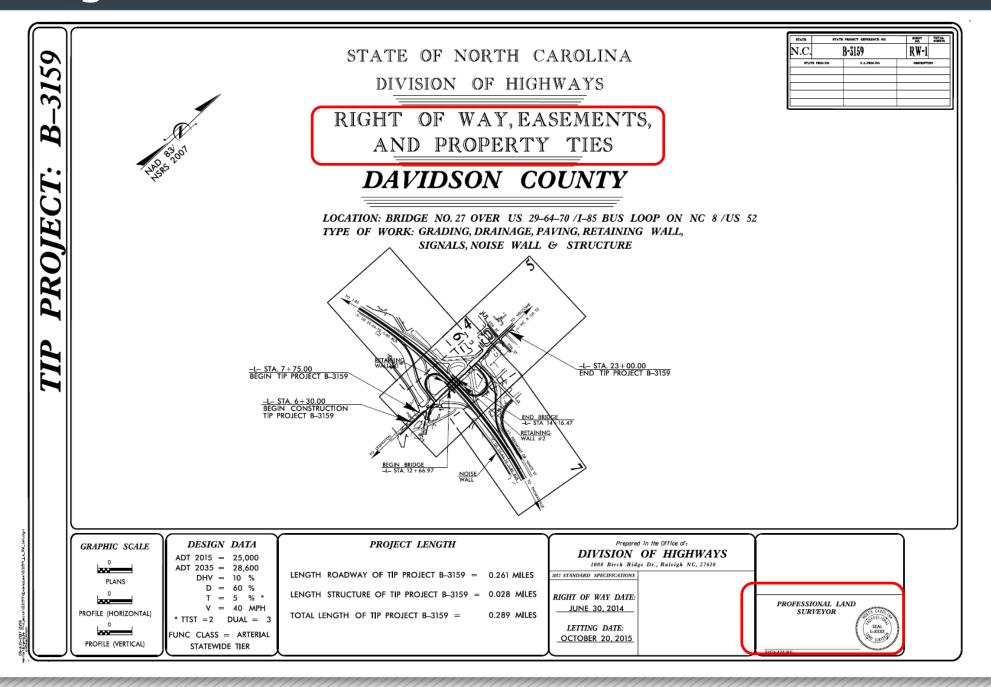
I. IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

2. PROJECT CONTROL WAS ESTABLISHED USING CNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

## **RW Series Sheets**

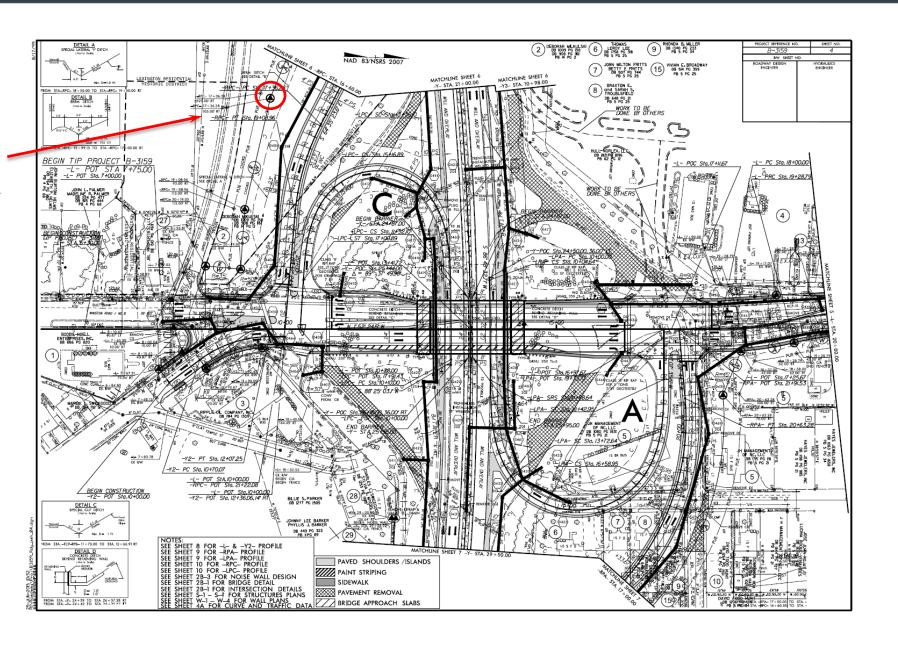
- Modified Plan Sheets for Clarity
- Property Ties Now On RW Sheets

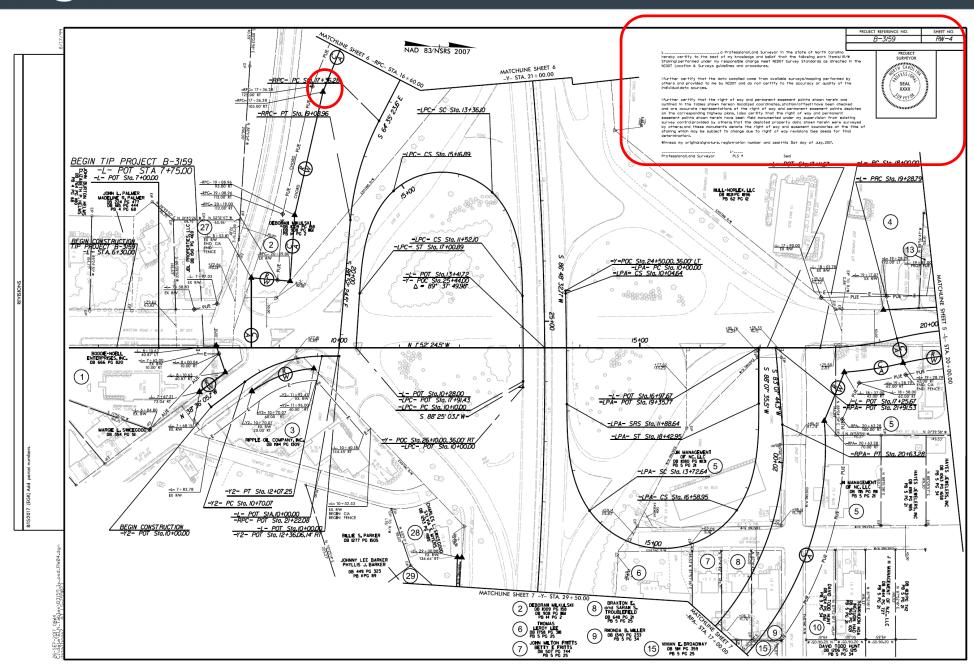




### ncdot.gov

Possible cell replacement to reflect Rebar and Cap





### ncdot.gov

### Report of Final R/W and Permanent Easement Survey

(Replacement and /or Re-establishing Verification of Right of Way and Permanent Easement Markers for the North Carolina Department of Transportation)

Project No.:

County:

**Project Description:** 

Plans Recorded in: <County Highway Plan Book designation, i.e. Map Book, Page>

I certify that this survey was done under my responsible charge in accordance with the <u>NCDOT Survey Standards</u> as directed in the <u>NCDOT Location & Surveys Guidelines and Procedures</u> and the <u>Manual for Construction Layout</u> for the purpose of (re-establishing/replacement) of R/W and/or permanent easement markers. That per the Project Plans of Record the following list of markers were either re-established or replaced at the following station/offset locations:

Line Descriptor (-L-,-Y-, etc.)	Station	Offset	Northing	Easting	Re-placed or Re- established	Type and Material of Original Marker	Type and Material of New Marker
Examples L	28+56.23	148.66, Rt.	878,948.23	2,456,128.92	Re-placed	R/W, Iron Pin & Cap	R/W, Concrete
Y	58+72.66	167.89, Lt.	868,785.45	2,456,849.88	Re- established	Easement, Iron Pin & Cap	Easement, Iron Pin & Cap

All bearings and coordinates are referenced to the North Carolina State Plane Coordinate System per Plans of Record.

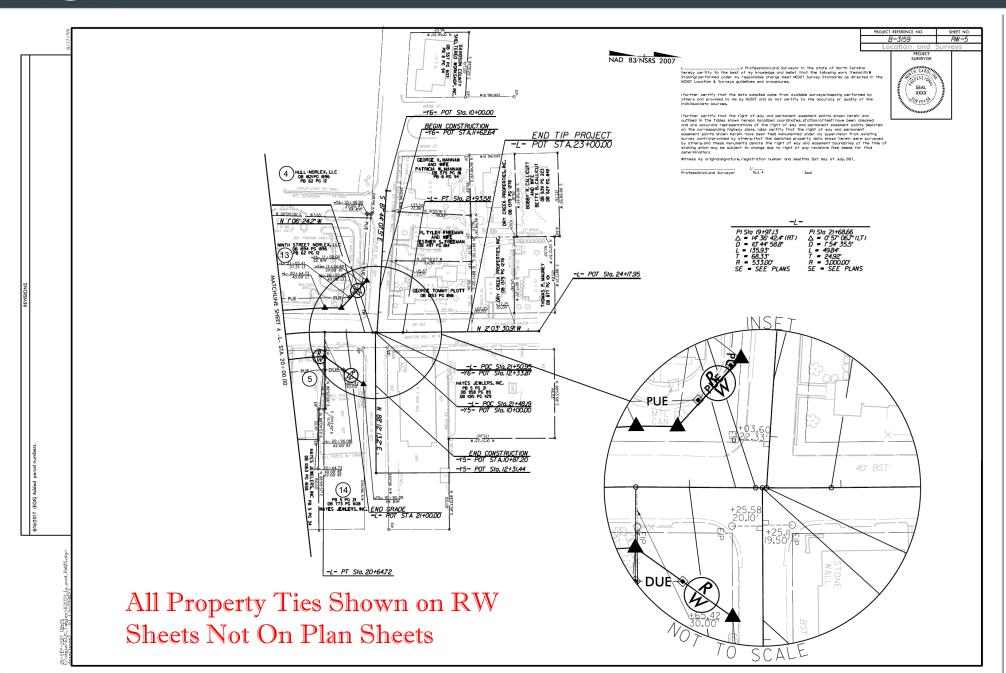
Signature

Witness my signature, registration number and seal	thisday of,20 <u>XX</u>
Professional Land Surveyor (Print Name)	PLS#
SEAL SEAL	

Surveyor's Seal

### 21 NCAC 56 .1602 SURVEYING PROCEDURES

(f) The results of a survey shall be reported to the user of that survey as a map or report of survey and, whether in written or graphic form, shall be prepared in a clear and factual manner. All reference sources shall be identified. Artificial monuments called for in such reports shall be described as found or set. When no monument is found or set for points described in Paragraph (e) of this Rule, that fact shall be noted.



## Questions/Discussion

